3N142

3875081 G E SOLID STATE 01E 14989 D T-31-25

Silicon Insulated-Gate Field-Effect Transistor

For Industrial and Military Applications to 175 MHz

Features:

- *Large dynamic range*
- *Enhanced signal-handling capacity for low cross modulation*
- *Dual-polarity gate permits positive and negative swing without degradation of input impedance*
- *Reduced spurious responses in FM receivers*
- *Permits use of vacuum-tube biasing techniques*
- *Excellent thermal stability for critical oscillator designs*

Applications:

- *RF amplifier, mixer, and oscillator in:*
  - *CB and mobile communication receivers*
  - *Aircraft and marine receivers*
  - *CATV and MATV equipment*
- *Industrial control circuits*
- *Variable attenuators*
- *Current limiters*
- *Instrumentation equipment*
- *High-impedance timing circuits*

RCA-3N142• is a silicon, insulated-gate field-effect transistor of the N-channel depletion type utilizing the MOS* construction. It features

- high input resistance — 1000 megohms
- low feedback capacitance — 0.2pF max.
- low noise figure — 4dB typ.
- high useful power gain —
  - neutralized — 17dB typ. } at 100MHz
  - unneutralized — 14dB typ. } at 100MHz
- hermetically sealed TO-104 metal package

RCA-3N142 is intended primarily for use as the rf amplifier in FM receivers covering the 88 to 108MHz band, but can be used for general amplifier applications at frequencies up to 175 MHz.

The wide dynamic range of the 3N142 reduces cross-modulation effects in AM receivers and minimizes the generation of spurious responses in FM receivers.

• Formerly Dev. No. TA7306.

* Metal-Oxide-Semiconductor.

Maximum Ratings, *Absolute-Maximum Values:*

DRAIN-TO-SOURCE VOLTAGE, V_{DS}	+20 max. V
GATE-TO-SOURCE VOLTAGE, V_{GS}:	
Continuous	0 to −8 max. V
Instantaneous	±15 max. V
DRAIN-TO-GATE VOLTAGE, V_{DG}	+20 max. V
DRAIN CURRENT, I_D**	50 max. mA
TRANSISTOR DISSIPATION, P_T:	
At ambient temperatures } up to 85°C	100 max. mW
At ambient temperatures } above 85°C	derate at 6.67mW/°C
AMBIENT TEMPERATURE RANGE:	
Storage	−65 to +100°C
Operating	−65 to +100°C
LEAD TEMPERATURE (During Soldering):	
At distances ≥1/32" from seating surface for 10 seconds max.	265 max. °C

** Pulse Value. Pulse duration, 20 ms max., Duty factor ≤ 0.1

3N142

ELECTRICAL CHARACTERISTICS, at $T_A = 25°$ C Unless Otherwise Specified. Bulk (Substrate) Connected to Source

CHARACTERISTICS	SYMBOLS	TEST CONDITIONS				LIMITS			UNITS
		FREQUENCY f	DC DRAIN-TO-SOURCE VOLTAGE V_{DS}	DC GATE-TO-SOURCE VOLTAGE V_{GS}	DC DRAIN CURRENT I_D	TYPE 3N142			
		MHz	V	V	mA	Min.	Typ.	Max.	
Drain-to-Source Cutoff Current	I_D(off)		20	−8		—	—	100	μA
Zero-Bias Drain Current*	I_{DSS}		15	0		5	20	50	mA
Gate Reverse Current	I_{GSS}	$T_A = 25°C$	0	−8		—	—	1	nA
		$T_A = 100°C$	0	−8		—	—	100	nA
Gate-to-Source Cutoff Voltage	V_{GS}(off)		20		0.05	−2	−5	−8	V
Small-Signal, Short-Circuit Reverse-Transfer Capacitance (Drain-to-Gate)	C_{rss}	1	15		5	—	0.12	0.2	pF
Input Resistance	r_{is}	100	15		5	2	4.5	—	KΩ
Input Capacitance	C_{iss}	1	15		5	—	5.5	10	pF
Output Resistance	r_{os}	100	15		5	2.25	4.2	—	KΩ
Output Capacitance	C_{oss}	100	15		5	—	1.4	—	pF
Forward Transconductance	g_{fs}	100	15		5	4	7.5	—	mmho
Maximum Available Power Gain	MAG	100	15		5	—	24	—	dB
Maximum Usable Power Gain (Unneutralized)	MUG	100	15		5	—	14	—	dB
Maximum Usable Power Gain (Neutralized)	MUG	100	15		5	15	17	—	dB
Noise Figure	NF	100	15		5	—	4	5	dB

* Pulse test: Pulse Duration 20 ms max. Duty Factor ≤0.15.

OPERATING CONSIDERATIONS

The flexible leads of the 3N142 are usually soldered to the circuit elements. As in the case of any high-frequency semiconductor device, the tips of soldering irons should be grounded, and appropriate precautions should be taken to protect the device against high electric fields.

This device should not be connected into, or disconnected from, circuits with the power on because high transient voltages may cause permanent damage to the device.

T-31-25

TYPICAL CHARACTERISTICS

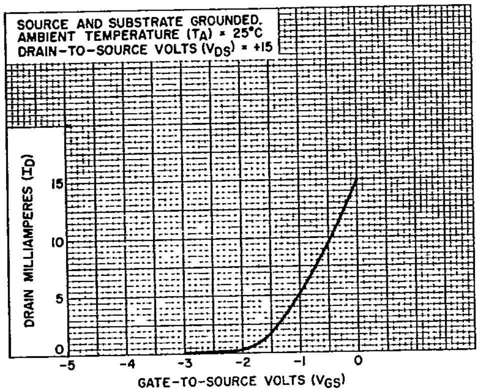

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Fig. 1 – Typical Characteristic of Drain Current (I_D) vs Gate-to-Source Voltage (V_{GS})

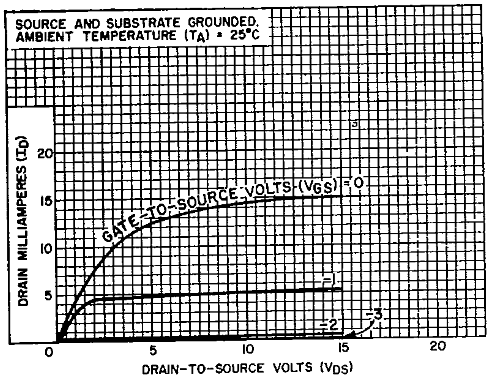

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Fig. 2 – Drain Current (I_D) vs Drain-to-Source Voltage (V_{DS})

TYPICAL y PARAMETER CHARACTERISTICS

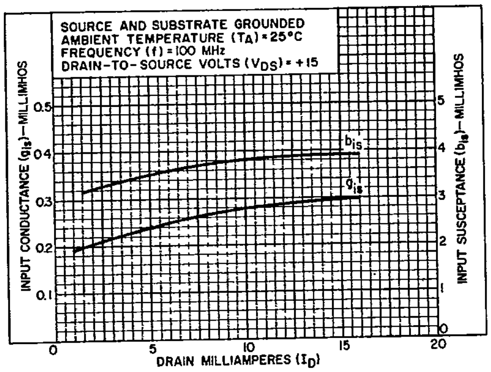

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Fig. 3 – Input Admittance (y_{is}) vs Drain Current (I_D)

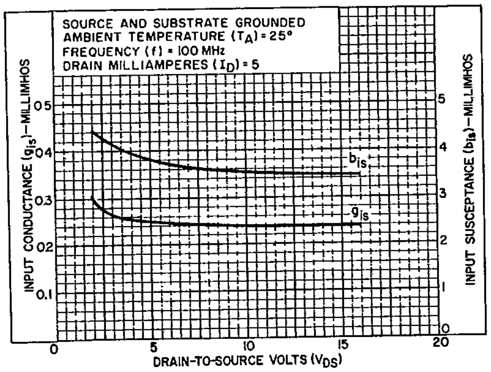

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Fig. 4 – Input Admittance (y_{is}) vs Drain-to-Source Voltage (V_{DS})

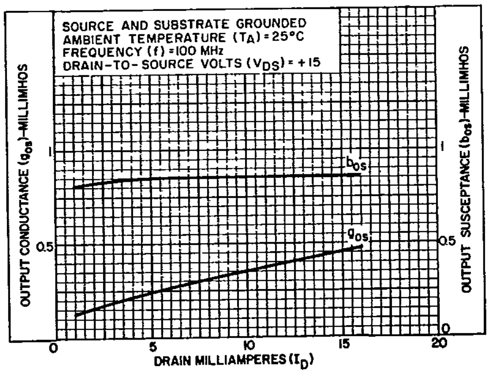

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Fig. 5 – Output Admittance (y_{os}) vs Drain Current (I_D)

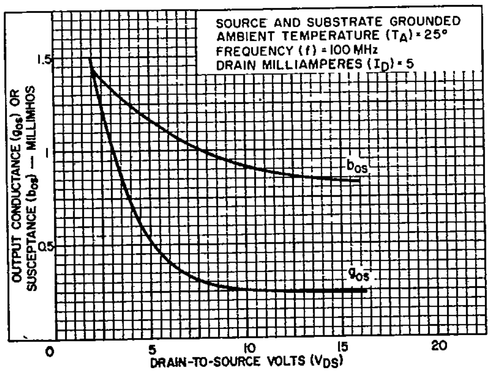

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Fig. 6 – Output Admittance (y_{os}) vs Drain-to-Source Voltage (V_{DS})

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TYPICAL y PARAMETER CHARACTERISTICS

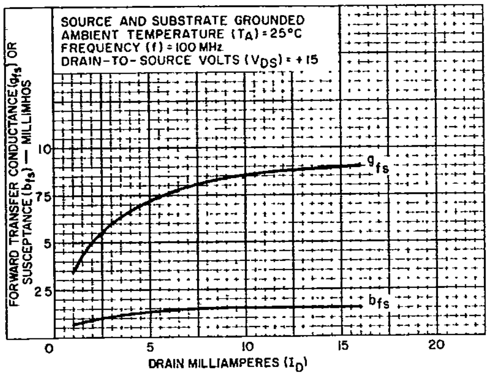

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Fig. 7 – Forward Transadmittance (y_{fs}) vs Drain Current (I_D)

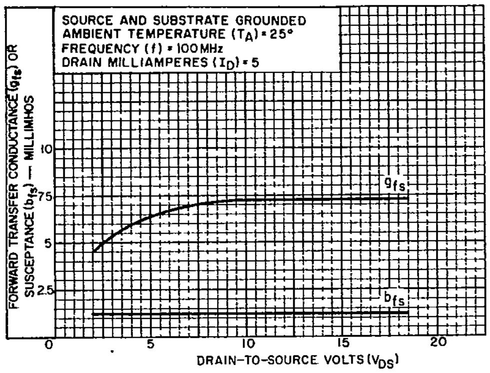

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Fig. 8 – Forward Transadmittance (y_{fs}) vs Drain-to-Source Voltage (V_{DS})

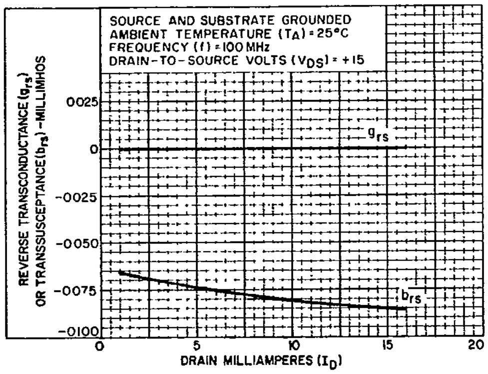

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Fig. 9 – Reverse Transadmittance (y_{rs}) vs Drain Current (I_D)

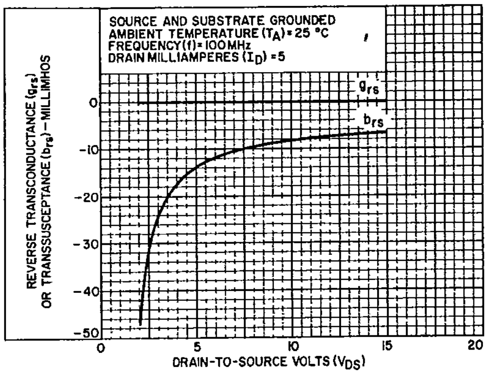

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Fig. 10 – Reverse Transadmittance (y_{rs}) vs Drain-to-Source Voltage (V_{DS})

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TYPICAL COMMON-SOURCE ADMITTANCE (Y) COMPONENTS vs FREQUENCY

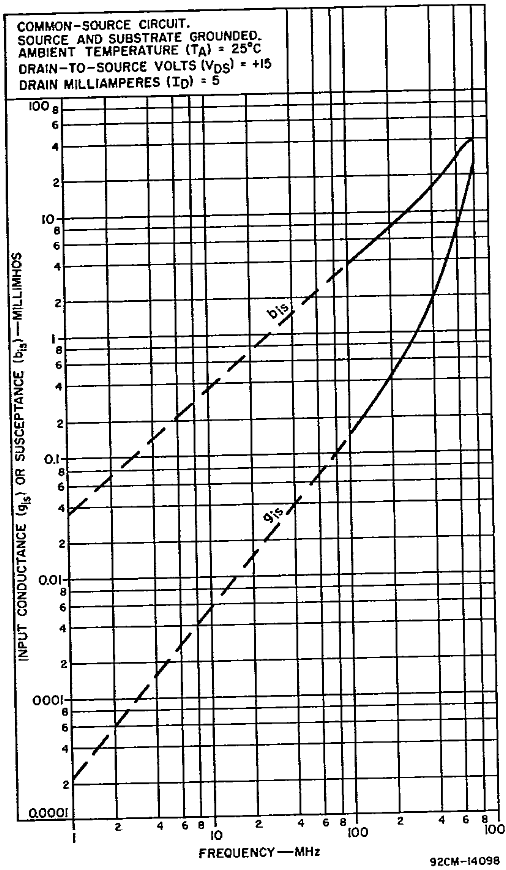

Fig. 11 – Input Admittance (Y_{is}) Components

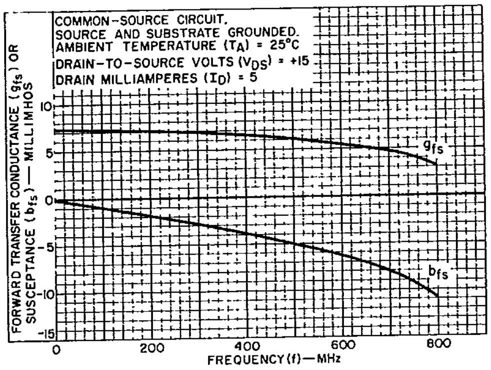

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Fig. 12 – Forward Transadmittance (Y_{fs}) Components

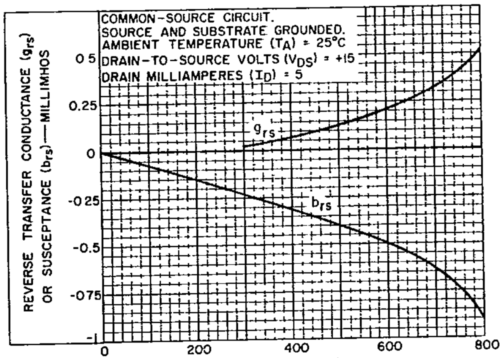

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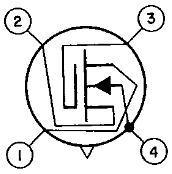
Fig. 13 – Reverse Transadmittance (Y_{rs}) Components

TERMINAL DIAGRAM



LEAD 1 - DRAIN
LEAD 2 - SOURCE
LEAD 3 - INSULATED GATE
LEAD 4 - BULK (SUBSTRATE) AND CASE

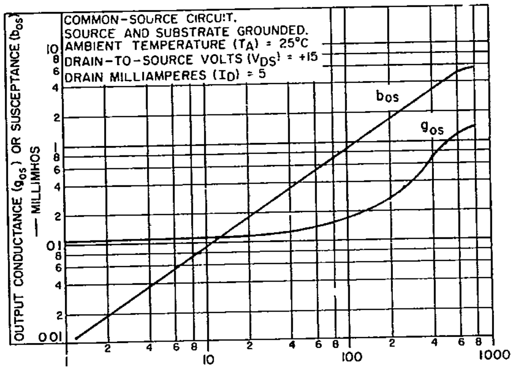


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Fig. 14 – Output Admittance (Y_{os}) Components